

SCIENCE & EDUCATION Impact

Benefits from USDA/Land-Grant Partnership

Beating Back Bacteria

Food technology slows the seven deadly pathogens.

The U. S. Department of Agriculture (USDA) estimates that medical costs and productivity losses resulting from just seven pathogens in food range between \$6.5 and \$34.9 billion annually. E. coli O157:H7, Campylobacter and Listeria may sound like chemical weapons, but they are just a few of the naturally occurring pathogens that threaten our food supply. Up to 33 million Americans are stricken by foodborne illness each year. Some 9,000 die as a result. USDA and Land-Grant university researchers are using food science and technology to reduce the threat of these pathogens.

Payoff

- **The chicken nor the egg.** Poultry products are highly susceptible to pathogens that cause food poisoning. A new *Salmonella*-killing pasteurization process developed by **North Carolina State** promises *Salmonella*-free eggs that may be used to make safe soft-boiled, soft-poached or sunny-side-up fried eggs, custards, Caesar salad dressing, ice cream, eggnog and sauces. The process, which received official FDA approval in 1999, also increases the shelf life of eggs from the typical 28 days to 60 days. A **Maryland** study found that simply washing chicken meat for 10 minutes in a 5 percent to 10 percent salt solution reduces the initial *Salmonella* contamination and also lowers its survival during refrigerated and frozen storage. **Texas A&M** and USDA scientists, found that giving day-old chicks a dose of bacteria from healthy adult chickens significantly reduces *Salmonella* and *Campylobacter* contamination in chickens under normal rearing conditions. This process is similar to the way vaccines work in humans. This method reduces contamination by up to 75 percent.
- **Shocking results.** Food scientists at **Ohio State** discovered that high voltage electric fields can kill harmful bacteria, from *E.coli* to *Salmonella* in coffee, beer, milk, fruit juices, chocolate liquor and liquid egg products. The U.S. Department of Defense, along with several large food corporations, is a partner in the research. In research on milk, scientists found that this type of processing destroyed harmful microorganisms with no significant change in color or composition of the milk.

RESEARCH,
EXTENSION AND
EDUCATION
AT WORK

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- **Same taste, just safer.** Irradiation of red meat is one way to control *E. coli*, but previously it caused meat to develop an off-flavor and off-odor. However, a **South Dakota State** breakthrough in irradiation technology ensures that meat irradiation can be accomplished without the loss of quality. **Kansas State** researchers found that irradiation is also an economical way of safely treating meat products. If processors build irradiation facilities next to their processing or distribution centers, the costs could be as low as about one cent per pound. If the irradiation has to be contracted out, it could cost 5 to 7 cents per pound. **Iowa State** researchers have trained 175 groups in proper irradiation techniques at the University's Linear Accelerator Facility (LAF).
- **Rapid detection.** Current detection methods for foodborne pathogens typically take from two to six days. This is far too slow to head off large food poisoning outbreaks. **Georgia** researchers have developed a test that can detect as few as four cells of *E. coli* and yield accurate results as little as 6-8 hours. **Cornell** researchers developed improved rapid methods for DNA fingerprinting of *Listeria*. This work was crucial for the early detection of at least two human listeriosis outbreaks. One in 1998 was linked to eating deli meats and hot dogs and was traced to more than 100 victims, at least 20 of whom died. This test contributed significantly to the early detection of the outbreak. **Florida's** "electronic nose" can help seafood inspectors do their job more quickly and more accurately. Once the nose is trained, it is objective and highly reliable. Although the nose is not yet approved for official federal inspections, the electronic noses could help seafood companies decide which catches to reject and when to process seafood instead of selling it fresh. **Penn State** researchers recently developed a new method that rapidly detects "injured" *Listeria* in pasteurized milk. Researchers found that the pathogen may only be injured following pasteurization and may still be dangerous if it recovers and grows in the milk and/or in the human body. This more sensitive test will ensure the safety of dairy products and the health of millions who consume these products daily in the United States.
- **Cornucopia of uses.** Polylactic acid (PLA) is a product derived from corn. Its uses range from an ingredient for biodegradable plastics to a meat sanitizer that prevents growth of *E. coli*. A new \$300 million PLA plant is being built, in part, due to research at **Missouri** and **Iowa State**. Research shows that meat pathogens are reduced more than tenfold when PLA is applied to meat carcasses after processing. A new plant in **Nebraska** will use 500 million bushels of corn to make PLA. This will create more than 100 jobs and raise the value of corn by more than 10 cents a bushel. This development could have a \$6 million impact on the corn industry.
- **Mouthwash for vegetables.** Cetylpyridinium chloride (CPC) has been used in mouthwash for more than 50 years, but recently **Arkansas** researchers discovered that it is effective against organisms that contaminate fresh fruits and vegetables. The research will mean a safer food supply and more profitable food processing facilities in the state.
- **Whey to go.** **Vermont** researchers are discovering ways to make processed meats stay safer longer. Using a whey protein-based edible coating, in conjunction with a number of naturally occurring anti-microbial agents, researchers were able to inhibit the growth of *Listeria* on beef frankfurters. Consumers will be better protected from potential health hazards caused by tainted foods, and the meat processing industry will be less at risk.



**Cooperative State Research, Education,
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